Original article / *Araştırma*

Neuroticism related attentional biases on an emotion recognition task

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ABSTRACT

Objective: *It has been suggested that neurotic individuals rapidly detect emotional stimuli as their cognitive system is may be in an alert mode that prioritizes the encoding of negative or threatening cues. However, it is still unknown whether this assumption could be generalized to all emotional faces or it is specific to certain types of emotional faces.* ***Methods:*** *To examine for this aim, 95 participants filled a set of questionnaires including 21 item Eysenck Personality Questionnaire. Subsequently, they performed an emotion recognition task that consisted of a series of emotional faces.* ***Results:*** *The results showed that neuroticism was associated with faster response times in the presented emotional faces but not happy faces. Also, neuroticism did not associate with accurate recognition of the faces except for sad faces.* ***Discussion:*** *It has been concluded that neuroticism which associated with information processing may cause negative biases because worry related negative affects cause selective attention toward negative stimuli. Thus, neurotic individuals rapidly detect negative stimuli as their cognitive system is on alert mode and therefore prioritizes encoding of negative or threatening cues.* ***(Anatolian Journal of Psychiatry 2019; 20(2):139-144)***

Keywords: *neuroticism, personality, emotion recognition, attentional bias, negative facial emotions, Eysenck, Ekman and Friesen*

Duygu tanıma testinde nevrotisizm ile ilgili seçici dikkat farklılıkları

ÖZ

Amaç: *Yüksek nevrotik düzeye sahip olan bireylerin bilişsel sisteminin olumsuzluk içeren duygusal uyarıcılara karşı daha duyarlı olduğu ve bu yüzden bu bireylerin duygu içerikli uyarıcıları daha çabuk fark ettiği varsayılmaktadır. Bu varsayımın sadece özgül bazı duyular için mi, yoksa bütün duygular için mi geçerli olduğu henüz bilinmemektedir. Bu yüzden, bu çalışmada duygu tanıma testi sırasında nevrotisizm ile ilgili seçici dikkat farklılıklarını incelemeyi amaçladık.* ***Yöntem:*** *Bunu test etmek için, 95 katılımcı Eysenck Kişilik Testi dahil, bir dizi ölçek doldurdu. Daha sonra, bu katılımcılar, bir dizi duygusal yüz ifadelerini içeren duygu tanıma testine tabii tutuldu.* ***Sonuçlar:*** *Sonuçlar yüksek düzeyde nevrotisizmin mutlu yüz ifadesi hariç, gösterilen diğer bütün duygulara hızlı tepki verme ile ilişkili olduğu bulundu. Ayrıca, nevrotisizm düzeyi arttıkça, üzgün yüzleri tanıma doğruluğunun da arttığı gözlendi.* ***Tartışma:*** *Sonuç olarak, bilgi işleme sürecini etkileyen nörotisizm puanı yüksek olan bireylerin negatif duygulara karşı daha dikkatli oldukları bulundu. Buna neden olarak, nevrotisizmin bilişsel sistemi etkileyerek negatif duygular içeren uyarıcılara karşı duyarlılığı artırdığı ve buradan gelen verilerin öncelikli olarak kodlandığı söylenebilir.* ***(Anadolu Psikiyatri Derg 2019; 20(2):139-144)***

Anahtar sözcükler: *Nevrotisizm, kişilik, duygu tanıma, dikkat seçiciliği, negatif duygusal yüz ifadeleri, Eysenck, Ekman ve Friesen*

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INTRODUCTION

Neuroticism is a trait, generally linked to an inclination towards negative emotions, higher levels of arousal, worry and anxiety.[1,2] This results in an increased risk of clinical anxiety and depression[3] which is associated with negative biases in processing of emotional information such as in recognition of emotions in facial expressions.[4-7]

Previous researchs suggests that neuroticism increases negative biases in information processing which involves perception, attention, and memory.[1,7-9] The reason for this is that neuroticism related negative affects lead to selective attention toward negative stimuli.[7,10] In this view, neurotic individuals rapidly detect negative stimuli because their cognitive system is somewhat on the alert mode that prioritizes encoding of negative or threatening cues.[3,6,11,12] Likewise, Eysenck proposed an arousal-based theory and suggested that high neurotics are influenced by negative cues such as pictures and emotional faces because neuroticism is associated with negative affects so that when encountering a negative cue, old negative memories can be retrieved. Empirical studies found that such attentional biases are frequently observed in anxious and depressed individuals as evident by faster response times in emotion related tasks.[7,8,11,13-17] Although negative biases in information processing have been well investigated in clinical anxiety[15,17] and depression,[13,18] the investigation of neuroticism is rather sparse in healthy samples and thus far inconclusive. While one study shows no significant associations between neuroticism and emotional face recognition in behavioral tasks,[73] in another study, it has been reported that neuroticism is associated with emotional face recognition as evident by faster responses[12] toward negative emotional faces or lower accuracy toward positive emotional faces.[6] One potential reason for the mixed results in previous studies might be that they often focus on either accuracy[6] or response times[3,12] in emotion recognition task. Thus, one aspect of relationship between neuroticism and emotion recognition is ignored. Another potential reason is that, those studies usually randomly invite participants and the confounding effects due to some factors such as presence of past or current psychologic or neurologic disorders, alcohol and caffeine consumption, current mood state usually were not excluded by using standard validated surveys.[5,6,12] These exclusion criteria were important to be employed because it has been previously found that these factors might have influence emotional and cognitive functioning.[19] Additionally, studies which only recruit extremely high and low neurotics by using extreme group approaches[7] may not allow generalizability of results.[12]

The present study aims to investigate the prediction of neuroticism regarding response times and accuracy in emotional facial expressions. To achieve this aim, the most widely used set of emotional faces[20] were used to assess participants' ability to recognize emotional facial expressions (accuracy and response latency), and regression analyses were performed to evaluate the associations with neuroticism. It is important to investigate such a potential association because previous studies showed the relationship between neuroticism and emotional face recognition indicates certain biases similar as the emotion processing occurs during the first episode of depression.[4,5] In this context, vulnerability to depression might be contributed by neuroticism.[8] As neuroticism associates with negative biases, the hypothesis to be tested is that neuroticism is associated with faster response times and higher accuracy in negative faces because of attentional biases toward negative stimuli in neurotics.

METHODS

Participants

One hundred and ten participants were invited to take part in the experiment from the undergraduate or postgraduate student cohort at Brunel University London. From this sample, fifteen participants were excluded based on employed exclusion criteria which are explained below in materials section. In the last case, ninety-five participants (43 female, 52 males, i.e. genders were matched as 45% females and 55% males) aged 18 to 37 (21.80±4.20 years), (neuroticism scores ranged 1 to 24; 11.94±5.40) took part in the study. In our sample, the participants were from young population who are aged between 18 and 35 and genders were roughly matched (%45 female and %55 male). This sample size seems to be sufficient for the current research as earlier studies regarding power analyses indicate that around 100 participants should provide an adequate sample size for the rejection or acceptance of the null hypothesis.[21] These participants had normal or corrected to normal vision. Before participation,

each participant gave written informed consent. The participants were paid £10 for the one-hour involvement in the study. The study was approved by the Department of Life Sciences Ethics Committee at Brunel University London.

Materials

Questionnaires: The 21 item Neuroticism Scale of the Eysenck Personality Questionnaire (EPQ) was used to establish the neuroticism level of each participant.[2] It has been reported that report reliability for neuroticism scale is 0.88 coefficient alpha. To avoid potential confounding effects of depression, participants with a Beck Depression Inventory (BDI) score of 15 or higher were excluded. BDI has yielded adequate reliability estimates, with a mean coefficient alpha of 0.81 for non-psychiatric subjects.[9] Additionally, the Mini International Neuropsychiatric Interview[22] was used to eliminate participants who had a history of psychiatric or neurological illness and an alcohol and caffeine consumption questionnaire was used to exclude possible effects of alcohol and caffeine. No participant was reported to be color blind as tested by the Ishihara color blindness test.[23] The reason for employment of such exclusion criteria is that to avoid confounding effects from those factors because those might have influence emotional and cognitive functioning.[19]

Emotional Face Recognition Task: The Picture of Affect series proposed by Ekman and Friesen was used to investigate the association between neuroticism and emotional face recognition (reliability 0.91). In this pack of pictures, there are six emotional facial expressions which are happy, sad, fearful, angry, surprised, and disgusted with a total of twenty-four faces in each category.[20] Overall emotional stimuli consist of 144 pictures that are morphed between the full emotion 100% and 25% steps. This indicated density of emotion in presented faces. All images were set up on E-Prime (18-2.0.8.22) (Psychology Software Tools, Philadelphia, USA). Mean response times and correct hits for each emotional picture were calculated to obtain the outcome measures.

Procedure

All participants were given time to read and sign their written informed consent and were tested individually in a cubicle room. After eligible participants were selected based on exclusions criteria, they completed the neuroticism scale of the EPQ. Finally, the participants were seated in front of the computer to perform the facial emotion recognition task. Emotional faces were displayed for 500ms on the computer screen. After this time interval, six emotions were presented. Participants were required to respond to the appropriate emotion that described the previous face by using the mouse provided to click on the emotion 1000 ms. If they correctly recognize the emotion, they receive a feedback which is 'correct'. On the other hand, if they did not recognize the emotion correctly or they did not respond for 1000ms then they receive a feedback which is 'wrong'.

RESULTS

The data from this study were analyzed by using SPSS for Windows 22.0 (Statistical Package for Social Sciences for Windows). In the analyses, Descriptive statistics, Pearson Correlation Coefficients, and simple linear regression results were reported respectively. The independent variable was neuroticism level, and the dependent variables were reaction times (RT) and accuracy of Emotional Facial Recognition task.[20]

To examine Table 1. It could be seen that the standard deviations are in the normal ranges. Also, participants had the highest and the lowest mean of accuracy were observed for happy and disgusted faces respectively. In terms of response times, the highest mean was observed in fearful faces while the lowest mean was seen in recognition of sad faces.

Table 1. Descriptive statistics for neuroticism scores and emotional faces regarding accuracy and response times

Outcome measures	n	Mean±SD
Neuroticism scores	95	11.96±5.41
Angry accuracy	95	0.49±0.14
Disgusted accuracy	95	0.38±0.09
Fearful accuracy	95	0.46±0.14
Happy accuracy	95	0.82±0.09
Sad accuracy	95	0.67±0.14
Surprised accuracy	95	0.62±0.13
Angry reaction times	95	1376.94±396.80
Disgusted reaction times	95	1235.04±359.71
Fearful reaction times	95	1437.62±413.59
Sad reaction times	95	968.29±293.93
Happy reaction times	95	1252.98±442.80
Surprised reaction times	95	1341.60±426.39

Pearson correlation coefficient results showed that neuroticism level negatively correlated with response times in recognition of angry faces r=-0.27; disgusted faces r=-0.35; fearful faces r=-0.24; sad faces r=-0.48; surprised faces r=-0.28 however neuroticism did not significantly correlate with happy faces r=-0.08. In addition, no significant correlations were found between emotion recognition in terms of accuracy all r maximum <0.17 and minimum >-0.006; except for sad faces r=0.21.

Preliminary analyses were performed to ensure to there is no violation of assumption of normality and linearity [-1<kurtosis and skewness for all variables>1; collinearity statistics VIF<10 and CI>30; Durbin Watson<2]. Simple linear regression results showed that neuroticism level significantly predicts faster RTs in recognition of angry faces $t_{(95)}$=-2.73, p=0.008, β=-0.27. A significant regression equation was found $F_{(1, 94)}$=7.57, p=0.007 with an R^2 of 0.074. The result indicates that higher neuroticism level predicts 7.4% of the variability in faster RTs of angry face recognition. Neuroticism level significantly predicts RTs in recognition of fearful faces $t_{(95)}$=-2.35, p=0.02, β=-0.24. A significant regression equation was found $F_{(1, 94)}$=5.92, p=0.02 with an R^2 of 0.05. The result indicates that higher neuroticism level predicts 5% of the variability in faster RTs of fearful face recognition. Happy faces showed that neuroticism level did not predict variability in RTs nor accuracy of recognition of happy faces; all RTs and accuracy $t_{(95)}$<-1.19, p>0.23, β=-0.12 and regression equation was found $F_{(1,94)}$=1.40, p>0.23 with and R^2 of 0.015. Neuroticism level significantly predicts RTs in recognition of sad faces $t_{(95)}$=-5.38, p<0.001, β=-0.48. A significant regression equation was found $F_{(1,94)}$=28.21, p<0.001 with an R^2 of 0.2394. The result indicates that higher neuroticism level predicts 23.94% of the variability in faster RTs of sad face recognition. Neuroticism level significantly predicts RTs in recognition of surprised faces $t_{(95)}$=-2.73, p=.008, β=-0.27. A significant regression equation was found $F_{(1,94)}$=7.46, p=0.008 with an R^2 of 0.074. The result indicates that higher neuroticism level predicts 7.4% of the variability in faster RTs of surprised face recognition.

Regarding accuracy, neuroticism level predicts significant variability only in accuracy of sad faces recognition: $t_{(95)}$=2.20, p=0.04, β=0.21. The regression equation showed significant results $F_{(1,94)}$=4.16, p=0.04 with an R^2 of 0.042. The result indicates that higher neuroticism level predicts 4.2% of variability by higher accuracy in sad faces recognition.

DISCUSSION

The current study aimed to examine whether higher levels of neuroticism associated with negative attentional biases on facial emotion recognition task. It has been observed that high and low neurotics differed in response times of emotional faces except for happy faces. Second, we observed that high neurotics were more accurate than low neurotics in recognition of sad faces only. However, previous empirical studies show negative attentional biases in only one or few of emotional faces and they investigate either response time[12] or accuracy of emotion recognition.[6] Conversely, in our study, we observed negative attentional biases might associate with all indicated negative emotional faces and surprised faces regarding response times. The potential reason for that is in the current study, a strict exclusion criterion was employed and both response times and accuracy were investigated.[7]

It should also be noted that among negative emotional faces, neuroticism predicted significant variability regarding accuracy only in sad faces. The potential reason for that is sadness is strongly associated with worry which is indeed a manifestation of neuroticism.[1,3,24] In this context, neuroticism may had a stronger association with retrieving old negative memories, which put cognitive system in alert mode.

The current results are consistent with theoretical models which are related to neuroticism.[1,25-27] For example, the arousal-based theory of Eysenck proposed that high neurotics are influenced by negative emotional stimuli because these individuals incline to negative emotions. Therefore, when high neurotics encounter negative stimuli, they are more reactive compared to low neurotics because their worry related memories are triggered due to the encountered stimuli. In line with that, the other neuroticism related theories such as the cognitive theory of depression proposed that neuroticism causes negative biases in information processing because worry related negative affects cause selective attention toward negative stimuli.[27] Thus, neurotic individuals rapidly detect negative stimuli as their cognitive system is on alert mode and therefore prioritizes encoding of negative or threatening cues.[6,12]

To summarize, high neurotics were found to

have attentional biases toward negative emotional faces as evident by faster response times in negative emotional faces and higher accuracy in sad faces. As theoretical models and empirical studies suggest, it seems neuroticism modulates recognition of emotional faces by withdrawal from negative emotional stimuli. The reason for that is high neurotics are inclined toward negative affectivity which interacts with retrieving worry related emotional memories due to negative attentional biases.[1,10,12,28]

In conclusion, the present study demonstrates that highly neurotic participants showed faster response times toward presented negative faces as compared to low neurotics. Also, they were significantly more accurate in recognition of sad faces. Future studies should focus on the detailed effects of neuroticism on emotion recognition as it will facilitate reaching a more comprehensive conceptualization of the emotional impairments in high neurotics.

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